

# **CEMENTING AND CASING ACCESSORIES**

Date: June 2026

**Cementing and Casing Accessories** are specialized tools and equipment used during the drilling and completion of oil and gas wells. Their primary purpose is to ensure proper **zonal isolation**, **wellbore stability**, and **structural integrity** of the well.

### Why Are They Needed?

- **Prevent Wellbore Collapse:** The earth's formations can cave in after drilling. Casing (steel pipe) lines the hole to keep it open.
- **Zonal Isolation:** Cement pumped between the casing and wellbore wall creates a barrier that prevents fluids (oil, gas, water) from migrating between different geological formations.
- **Pressure Containment:** Casing strings contain formation pressures and prevent blowouts.
- **Protect Freshwater Aquifers:** Surface casing isolates potable water zones from contamination.
- **Support Wellhead Equipment:** Casing provides a foundation for blowout preventers (BOPs) and wellhead assemblies.

**Note:** *Casing and cementing procedures have grown more sophisticated in recent years as the search for new hydrocarbon-bearing reservoirs takes wells deeper and into more hostile environments. [https://petex.utexas.edu/images/book\\_previews/Casing-and-Cementing\\_previewwtrmrk.pdf](https://petex.utexas.edu/images/book_previews/Casing-and-Cementing_previewwtrmrk.pdf)*

## TOOLS ARRANGED IN STANDARD SEQUENCE OF USE

The following is the **correct operational sequence** — from the tool needed first to last during well construction:

| S.No. | Tool                     | Position in Well                    | Primary Function                                  |
|-------|--------------------------|-------------------------------------|---------------------------------------------------|
| 1     | Casing Pipe              | Entire wellbore length              | Structural lining of the well                     |
| 2     | Casing Shoe / Float Shoe | Bottom of casing string             | Guide casing into wellbore + prevent backflow     |
| 3     | Float Collar             | 1-3 joints above shoe               | Secondary backflow prevention + plug landing seat |
| 4     | Centralizer              | Along casing string                 | Keep casing centered for uniform cement           |
| 5     | Casing Scraper           | Run before casing / during clean-up | Remove debris and scale from casing wall          |

## TOOL 1: CASING PIPE

### What is it?

Casing pipe is a large-diameter steel pipe that is inserted into a drilled wellbore and cemented in place. It forms the primary structural element of the well.

### When is it used?

- At multiple stages during drilling (conductor, surface, intermediate, and production casing)
- After each section of the hole is drilled to a planned depth

### How is it used?

- Joints of casing (typically 30-40 ft / 9-12 m each) are threaded together and lowered into the wellbore
- Once at depth, cement is pumped down through the casing and up the annulus
- Multiple casing strings are run consecutively, each inside the previous one

### Why is it used?

- Prevents wellbore collapse
- Isolates formations
- Contains formation pressures
- Provides a conduit for production tubing

### General Measurements (API Standard)

| Parameter        | Specification                            |
|------------------|------------------------------------------|
| OD Range         | 4½" (114.3 mm) to 20" (508 mm)           |
| Common Sizes     | 4½", 5½", 7", 9⅝", 13⅝", 20"             |
| Wall Thickness   | 5.21 mm to 16.13 mm                      |
| Length per Joint | R1: 16-25 ft, R2: 25-34 ft, R3: 34-48 ft |
| Steel Grades     | H40, J55, K55, N80, L80, P110, Q125      |
| Thread Types     | STC, LTC, BTC, Premium                   |

### Oil India Limited Specifications

Based on recent tenders, Oil India Limited commonly uses:

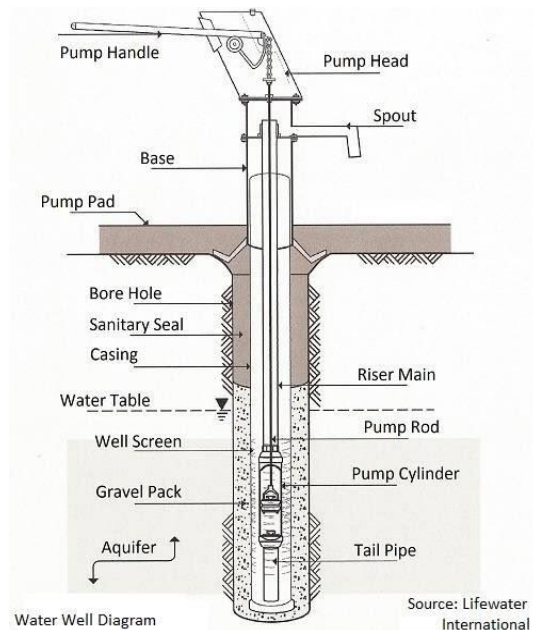
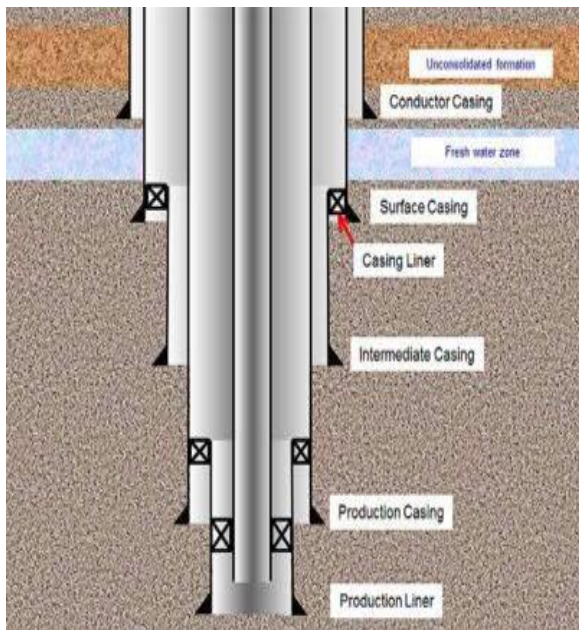
| Casing Size | Weight (PPF) | Grade   | Connection | Application             |
|-------------|--------------|---------|------------|-------------------------|
| 13⅝"        | 68 ppf       | P110    | BTC        | Intermediate/Production |
| 4½"         | 15.1 ppf     | P110    | Premium    | Production              |
| 20"         | —            | —       | —          | Surface/Conductor       |
| 9⅝"         | —            | Premium | —          | Various                 |

### Typical OIL Casing String Design:

- **Conductor:** 20" or 30" (shallow, near-surface)
- **Surface Casing:** 13 $\frac{3}{8}$ " (protects freshwater zones)
- **Intermediate Casing:** 9 $\frac{5}{8}$ " (isolates problem zones)
- **Production Casing:** 7" or 4 $\frac{1}{2}$ " (reaches reservoir)

**Diagram Reference:** See attached images for casing pipe cross-section and wellbore diagram showing conductor, surface, intermediate, and production casing strings.

### Diagram



## TOOL 2: CASING SHOE / FLOAT SHOE

### What is it?

A Casing Shoe (also called Float Shoe or Guide Shoe) is a specialized fitting attached to the bottom end of the casing string. It has a rounded or bullet-shaped nose that guides the casing past obstructions and deviations in the wellbore. Float shoes incorporate a one-way check valve.

### When is it used?

At the very bottom of every casing string being run, during primary cementing operations.

### How is it used?

- Threaded onto the bottom joint of casing
- As casing is lowered, the rounded nose prevents hanging up on ledges
- The internal check valve allows fluid to flow downward but prevents backflow upward
- After cementing, it prevents cement from flowing back into the casing

### Why is it used?

- **Guides** — casing to total depth smoothly
- **Prevents backflow** — of cement slurry (U-tube effect)
- **Provides buoyancy** — to casing during run-in
- **Acts as an internal BOP** — during running operations

### Types of Casing Shoes

- **Guide Shoe:** Simple rounded nose, no valve
- **Float Shoe:** Guide shoe + check valve
- **Auto-Fill Float Shoe:** Valve stays open during run-in, closes when ball is dropped
- **Stab-In Float Shoe:** For large-diameter casing, cement pumped through drill pipe

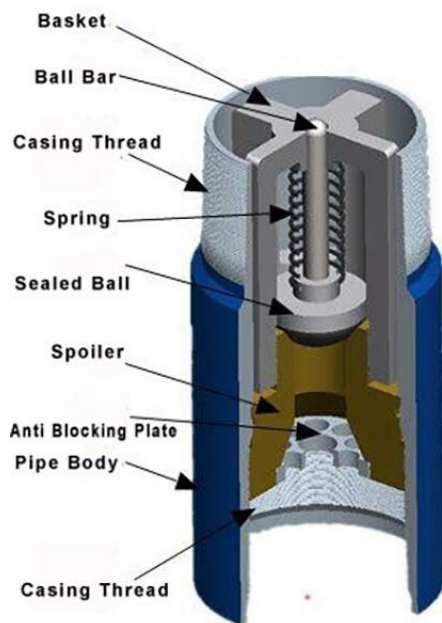
### General Measurements

| Parameter       | Specification                                 |
|-----------------|-----------------------------------------------|
| Sizes Available | 3½" to 30" (matching casing sizes)            |
| Nose Types      | Cement nose, Aluminum nose, Bladed nose       |
| Valve Types     | Single valve, Double valve                    |
| Pressure Rating | Up to 10,000 psi                              |
| Material        | API Grade Steel body, PDC-drillable internals |

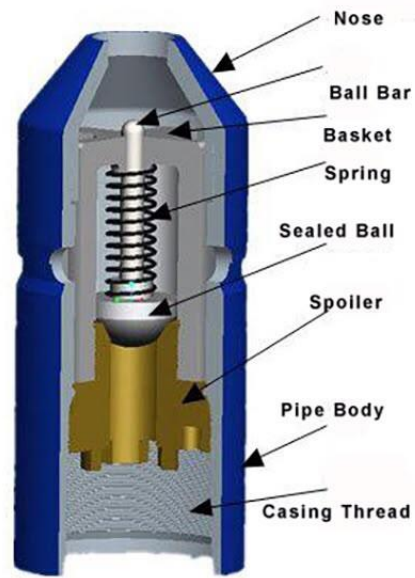
### Oil India Limited Specifications

- OIL typically uses P110 grade float shoes matching their casing grades
- Premium threaded connections for high-pressure wells
- Double-valve configuration for added safety in deep wells

## Diagram (Cutaway View with Labels)



Float Collar



Float Shoe

### Key Components (from cutaway diagram)

- **Nose** — Rounded guiding tip
- **Ball Bar / Basket** — Valve mechanism support
- **Spring** — Returns valve to closed position
- **Sealed Ball** — Check valve element
- **Pipe Body** — Steel housing
- **Casing Thread** — Connection to casing joint

**Diagram Reference:** See attached images for Float Shoe and Float Collar cutaway diagrams with full component labelling.

## TOOL 3: FLOAT COLLAR

### What is it?

A Float Collar is a short casing coupling (1-3 joints long) installed above the float shoe in the casing string. It contains a one-way check valve similar to the float shoe and provides a landing seat for cementing plugs.

### When is it used?

Installed 1-3 joints above the float shoe, during primary cementing operations.

### How is it used?

- Threaded into the casing string above the shoe
- The check valve prevents fluid backflow after cement placement
- Provides a seat for the bottom cement plug to land on
- Traps contaminated fluid between the float shoe and float collar, keeping the shoe area clean

### Why is it used?

- **Secondary backflow prevention** (backup to float shoe)
- **Plug landing seat** — stops cement displacement at the correct point
- **Contamination trap** — isolates contaminated fluids from the shoe area
- **Pressure maintenance** — holds pressure on cement while it sets

### Types of Float Collars

- **Single-Valve Float Collar:** Standard, economical
- **Double-Valve Float Collar:** Extra backflow protection for HPHT wells
- **Auto-Fill Float Collar:** Casing fills automatically during run-in
- **Non-Rotating Float Collar:** Prevents rotation during drill-out

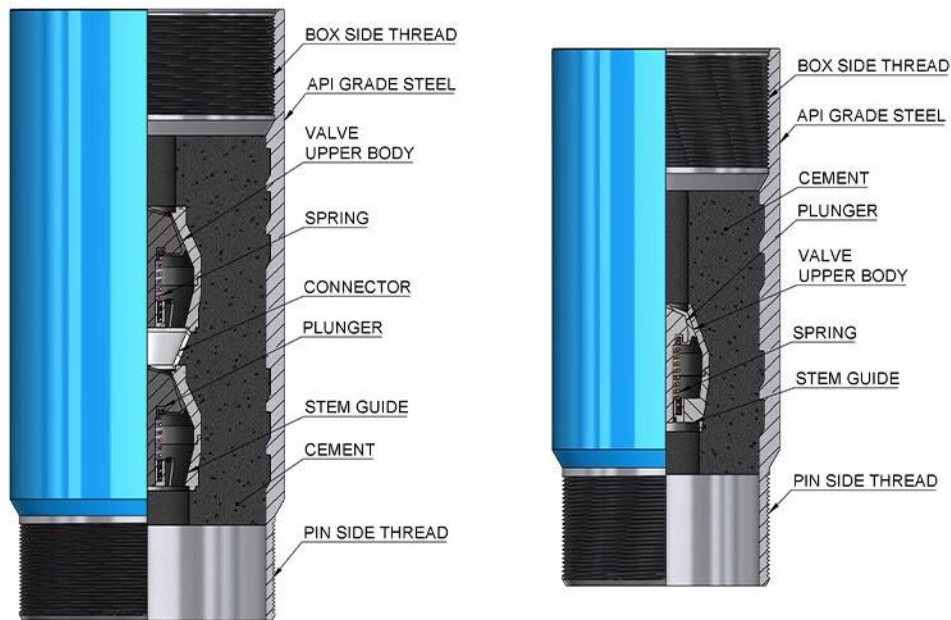
### General Measurements

| Parameter       | Specification                             |
|-----------------|-------------------------------------------|
| Sizes Available | 3½" to 30"                                |
| Valve Types     | Ball-type, Flapper-type, Plunger-type     |
| Pressure Rating | Up to 10,000 psi                          |
| Material        | API Grade Steel, PDC-drillable components |
| Standards       | API RP 10F, API Spec 10D                  |

### Oil India Limited Specifications

- Matches casing grade (typically P110)
- Premium threaded connections
- Double-valve design for deep well applications

## Diagram (Cutaway View with Labels)



### Key Components (from cutaway diagram)

- **Box Side Thread / Pin Side Thread** — Casing connections
- **API Grade Steel** — Outer body
- **Valve Upper Body** — Valve housing
- **Spring** — Valve return mechanism
- **Plunger / Connector** — Valve actuator
- **Stem Guide** — Valve alignment
- **Cement** — Internal cement fill for drillability
- **Anti-Blocking Plate** — Prevents debris entry

**Diagram Reference:** See attached images for Float Collar cutaway diagram with full component labelling including Box Side Thread, API Grade Steel, Valve Upper Body, Spring, Plunger, Stem Guide, Cement, and Anti-Blocking Plate.

## TOOL 4: CENTRALIZER

### What is it?

A Centralizer is a mechanical device attached to the outside of the casing string to keep it centered in the wellbore. This ensures uniform cement thickness around the casing.

### When is it used?

- Attached to casing joints before running in hole
- Especially critical in deviated and horizontal wells
- Used at regular intervals along the casing string

### How is it used?

- Bow-spring or rigid blades press against the wellbore wall
- As casing is lowered, centralizers expand to match hole diameter
- They maintain a standoff (typically 67% or more) between casing and wellbore
- This creates uniform annular space for cement placement

### Why is it used?

- **Uniform cement sheath** — prevents channeling and weak cement zones
- **Reduces casing wear** — minimizes contact with wellbore wall
- **Improves displacement efficiency** — better mud removal
- **Supports casing** — prevents sagging in deviated wells

### Types of Centralizers

- **Bow-Spring Centralizer:** Flexible, good for vertical/slightly deviated wells
- **Rigid Centralizer:** Fixed blade height, for deviated/horizontal wells
- **Spiral Vane Centralizer:** Creates vortex flow for better mud removal
- **Roller Centralizer:** Reduces drag in high-angle wells
- **Solid Centralizer:** Cast steel/aluminum, for maximum standoff

### General Measurements

| Parameter       | Specification                                     |
|-----------------|---------------------------------------------------|
| Sizes Available | 4½" to 20" (matching casing sizes)                |
| Standard        | API Spec 10D                                      |
| Standoff        | Typically 67% minimum                             |
| Materials       | Spring steel, Cast steel, Aluminum, Thermoplastic |
| Bow Heights     | Adjustable for different hole sizes               |

### Oil India Limited Specifications

- API 10D compliant centralizers
- Bow-spring type for vertical wells in Assam fields

- Spiral vane type for better cement displacement
- Hinged design for easy field installation

## Diagram

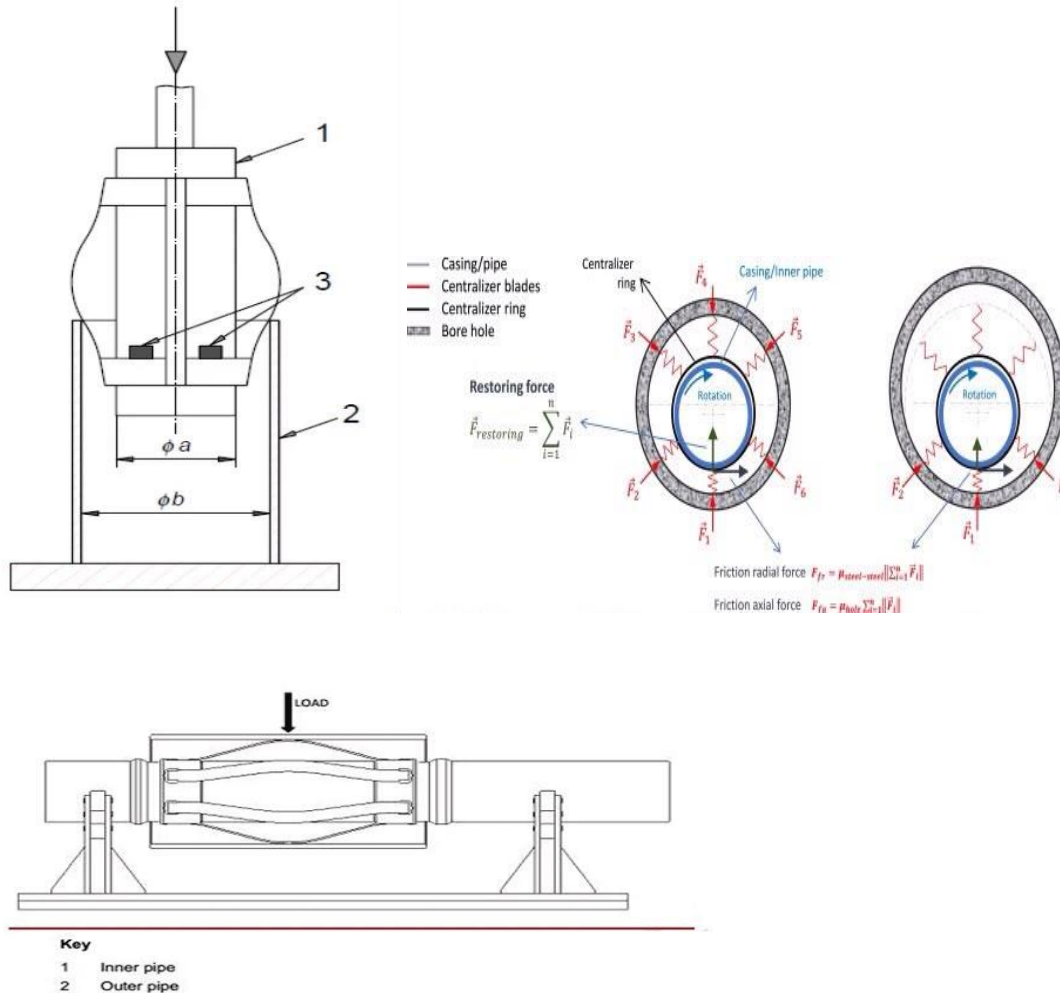


Figure 1 — Example of casing centralizer restoring-force test equipment

## Key Components (from diagram)

- **Centralizer Ring / End Collar** — Mounts on casing
- **Bow Springs / Blades** — Contact wellbore wall
- **Hinge Pins** — Connects halves (hinged type)
- **Inner Pipe** — Casing contact surface
- **Outer Pipe / Bore Hole** — Wellbore contact

**Diagram Reference:** See attached images for Bow Spring Centralizer diagram showing restoring force test equipment and cross-sectional view with Centralizer Ring, Bow Springs, and force vectors.

## TOOL 5: CASING SCRAPER

### What is it?

A Casing Scraper (also spelled "Scraper") is a wellbore clean-up tool with spring-loaded blades that scrape the inside wall of the casing to remove rust, scale, cement residue, and other debris.

### When is it used?

- Before running casing — to clean the previous casing string
- During workover operations — to prepare casing for new completions
- Before cementing — to ensure clean surface for cement bond

### How is it used?

- Attached to the drill string or tubing
- Run in and out of the casing (typically reciprocated)
- Spring-loaded blades expand to contact the casing wall
- Rotating or reciprocating motion scrapes off debris
- Circulation washes debris to surface

### Why is it used?

- **Removes debris** — prevents plugging of float equipment
- **Ensures cement bond** — clean surface improves cement adhesion
- **Prepares for completions** — clean casing for packers and seals
- **Prevents corrosion** — removes corrosive scale deposits

### Types of Scrapers

- **Rotating Scraper:** Used while rotating drill string
- **Reciprocating Scraper:** Used with up-down motion
- **Spring-Loaded Scraper:** Blades expand to fit casing ID
- **Fixed Blade Scraper:** For specific casing sizes

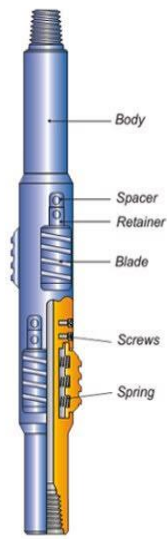
### General Measurements

| Parameter       | Specification                                                          |
|-----------------|------------------------------------------------------------------------|
| Sizes Available | 2 $\frac{7}{8}$ " to 13 $\frac{3}{8}$ " (matching tubing/casing sizes) |
| Blade Types     | Spring-loaded, Fixed, Spiral                                           |
| Materials       | Alloy steel body, Hardened steel blades                                |
| Connection      | API threads (pin/box)                                                  |

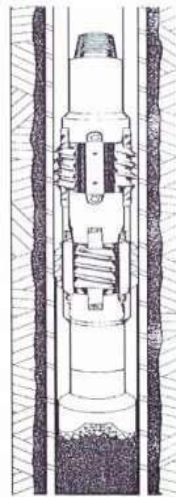
### Oil India Limited Specifications

- Standard API size scrapers matching OIL casing programs
- Spring-loaded design for variable casing wear
- Used in workover operations in mature Assam fields

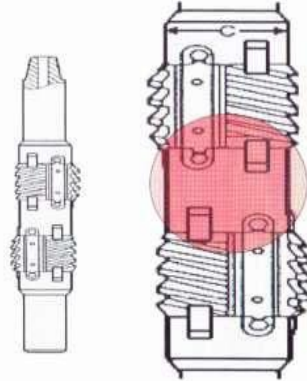
## Diagram (Cutaway View with Labels)



## BILCO TOOLS, INC.



Competitor's casing scrapers trap debris between the scraper blades because there is no flow area.



## Key Components (from cutaway diagram)

- **Body** — Main tool body
- **Spacer** — Adjusts blade position
- **Retainer** — Holds blade assembly
- **Blade** — Scraping element (hardened steel)
- **Screws** — Secures blade
- **Spring** — Provides outward force on blades

**Diagram Reference:** See attached images for Casing Scraper cutaway diagram with full labelling of Body, Spacer, Retainer, Blade, Screws, and Spring components.

## SUMMARY TABLE: OIL INDIA LIMITED TYPICAL SPECIFICATIONS

| Tool                   | OIL Typical Size                                               | OIL Typical Grade/Material     | Standard     |
|------------------------|----------------------------------------------------------------|--------------------------------|--------------|
| Casing Pipe            | 13 $\frac{3}{8}$ " × 68 ppf, 4 $\frac{1}{2}$ " × 15.1 ppf, 20" | P110, J55, K55                 | API 5CT      |
| Casing Shoe/Float Shoe | Matches casing size                                            | P110 compatible, PDC-drillable | API RP 10F   |
| Float Collar           | Matches casing size                                            | P110 compatible, Double-valve  | API RP 10F   |
| Centralizer            | Matches casing size                                            | API 10D, Bow-spring/Rigid      | API Spec 10D |
| Casing Scraper         | Matches casing/tubing size                                     | Alloy steel, Hardened blades   | API standard |

## COMPLETE WELL DIAGRAM SHOWING ALL COMPONENTS

The complete cementing assembly from top to bottom includes:

- **Cement Head** (surface) — Holds cementing plugs
- **Top Plug** — Separates cement from displacement fluid
- **Bottom Plug** — Wipes casing, separates mud from cement
- **Float Collar** — Plug landing seat + backflow prevention
- **Centralizer** — Keeps casing centered
- **Guide Shoe / Float Shoe** — Bottom guide + backflow prevention

**Diagram Reference:** See attached images for complete well cementing diagram showing Cement Head, Top Plug, Float Collar, Centralizer, and Guide Shoe in the wellbore assembly.